

## REGIONAL COMPETITION - ROUND 4

### TOSS-UP

1. ERSC; Multiple Choice: Over the years various techniques have been employed to determine the age of the Earth. Choose the method below that has produced the most accurate age of the Earth?
  - a) Rate of salt accumulation in the oceans
  - b) Fossil correlation and evolution
  - c) Cooling rates of minerals that form the crust of the Earth
  - d) Decay processes of radioactive isotopes in minerals

ANSWER: D--DECAY PROCESSES OF RADIOACTIVE ISOTOPES IN MINERALS

### BONUS

1. ERSC; Multiple Choice: Wind-eroded soil particles may travel thousands of miles in the air before being redeposited. What soil particle size class is the most susceptible to erosion and long-distance transport by wind?
  - a) sand
  - b) silt
  - c) clay
  - d) pebbles

ANSWER: B--SILT

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### TOSS-UP

2. BIOL; Multiple Choice: The section of a neuron that contains the nucleus and most of the metabolic machinery of the nerve cell is:
  - a) the dendrite
  - b) the soma
  - c) the axon
  - d) the synaptic terminals

ANSWER: B--SOMA

### BONUS

2. BIOL; Multiple Choice: The four different types of glial cells in the central nervous system are: astrocytes, oligodendrocytes, microglia, and ependymal cells. These cells are distinguished on the basis of size, intracellular organization and the presence of characteristic cytoplasmic processes. The glial cells responsible for maintaining the blood-barrier by isolating the interstitial fluid of the central nervous system from the general circulation are:
  - a) astrocytes
  - b) oligodendrocytes
  - c) microglia
  - d) ependymal cells

ANSWER: A--ASTROCYTES

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**TOSS-UP**

3. COMP; Multiple Choice: In Postscript, the command to display a string of text is:
- a) examine
  - b) show
  - c) display
  - d) print

ANSWER: B--SHOW

**BONUS**

3. COMP; Short Answer: A favorite illustration of the late Admiral Grace Hopper was holding up a piece of wire through which an electronic signal could travel in 1 nanosecond. Approximately how long would this wire be?

ANSWER: 0.3 METER (ACCEPT 20-40 CENTIMETERS OR 11 INCHES OR 1 FOOT)

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**TOSS-UP**

4. PHYS; Multiple Choice: A 50 kg crate slides down a frictionless plane 2 meters long. If the angle of the plane with the horizontal is 30 degrees, approximately what is the speed of the crate at the bottom of the plane?
- a) 1.0 m/sec
  - b) 2.2 m/sec
  - c) 4.4 m/sec
  - d) 9.8 m/sec

ANSWER: C--4.4 M/SEC

**BONUS**

4. PHYS; Short Answer: An object is 24 cm from a concave mirror with an 8 cm focal length. Where will its image be formed?

ANSWER: 12 CM IN FRONT OF THE MIRROR

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**TOSS-UP**

5. GENR; Multiple Choice: The peak to peak voltage of 115 volt AC house voltage is?
- a) 115
  - b) 115 times square root of two
  - c) 115 times square root of three
  - d) 230 times square root of two

ANSWER: D--230 TIMES SQUARE ROOT OF TWO

**BONUS**

5. GENR; Short Answer: What phenomenon associated with electromagnetic radiation allowed Hubble to determine that the universe is expanding?

ANSWER: THE DOPPLER EFFECT

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**TOSS-UP**

6. CHEM; Short Answer: Give the symbol and Latin name for the element antimony.

ANSWER: SB, FROM THE LATIN "STIBIUM" THE PRINCIPLE ORE OF ANTIMONY IS CALLED STIBNITE

**BONUS**

6. CHEM; Multiple Choice: The solubility of borax in water increases as the temperature increases. As this salt dissolves, heat is:
- a) evolved
  - b) absorbed
  - c) not a factor
  - d) converted to cold

ANSWER: B--ABSORBED

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**TOSS-UP**

7. ASTR; Short Answer: This coming July the shattered comet Shoemaker-Levy 9 is expected to crash into which planet?

ANSWER: JUPITER

**BONUS**

7. ASTR; Short Answer: Astronomers recently announced the first hints of what may be a silent majority in our galaxy - starlike objects too puny even to shine. These objects go by the acronym MACHO which stands for:

ANSWER: MASSIVE COMPACT HALO OBJECTS

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**TOSS-UP**

8. BIOL; Multiple Choice: The type of muscle tissue encircling vessels of the circulatory system is:
- a) striated voluntary muscle
  - b) striated involuntary muscle
  - c) nonstriated involuntary muscle
  - d) none of the above

ANSWER: C--NONSTRIATED INVOLUNTARY MUSCLE

**BONUS**

8. BIOL; Multiple Choice: The sliding filament theory of skeletal muscle contraction postulates the pivoting action of the myosin head of a sarcomere. The myosin pivots on the thin filament active sites of:
- a) troponin strands
  - b) tropomyosin strands
  - c) actin strands
  - d) none of the above

ANSWER: C--ACTIN STRANDS

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**TOSS-UP**

9. MATH; Multiple Choice: A third degree polynomial with real coefficients can NOT have:
- a) 3 real roots
  - b) 1 real root and 2 complex roots
  - c) 2 real roots and 1 complex root
  - d) any of the above

ANSWER: C--2 REAL ROOTS AND 1 COMPLEX ROOT

**BONUS**

9. MATH; Multiple Choice: Which of the following is NOT a conic section?
- a) ellipse
  - b) hyperbola
  - c) parabola
  - d) sigmoid

ANSWER: D--SIGMOID

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**TOSS-UP**

10. PHYS; Short Answer: If 5 joules of work are done in moving 0.025 coulombs of positive charge from point A to point B, what is the difference in potential between the points?

ANSWER: 200 VOLTS

**BONUS**

10. PHYS; Multiple Choice: A bowling ball that is initially sliding down the alley begins to rotate. As it does so, its linear velocity:
- a) increases
  - b) remains constant
  - c) decreases
  - d) is quantized

ANSWER: C--DECREASES

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### TOSS-UP

11. CHEM; Short Answer: Chemical species which have the same atomic mass number but different atomic numbers are called:

ANSWER: ISOBARS

### BONUS

11. CHEM; Multiple Choice: A traditional method for the quantitative analysis of nitrogen is:

- a) Friedel-Crafts reaction
- b) Kjeldahl (pronounced Kel dahl) method
- c) neither
- d) both

ANSWER: B--KJELDAHL METHOD

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### TOSS-UP

12. COMP; Multiple Choice: After a catastrophic computer system failure, what procedures would be implemented?

- a) security procedures
- b) backup procedures
- c) recovery procedures
- d) shutdown procedures

ANSWER: C--RECOVERY PROCEDURES

### BONUS

12. COMP; Multiple Choice: On DOS-based microcomputers, what keys are pressed simultaneously to "re-boot" the operating system?

- a) shift-escape
- b) control-break
- c) pause-tab-end
- d) alt-control-delete

ANSWER: D--ALT-CONTROL-DELETE

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**TOSS-UP**

13. BIOL; Short Answer: What disease was known as the White Plague?

ANSWER: TUBERCULOSIS

**BONUS**

13. BIOL; Multiple Choice: What is currently the leading cause of death of women in the United States?

- a) heart disease
- b) cancer
- c) infectious diseases
- d) accidents

ANSWER: B -- CANCER

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**TOSS-UP**

14. ASTR; Short Answer: The Nobel Prize for Physics in 1993 was won by two astronomers for their observations of an orbiting pair of superdense stars known as binary pulsars. Name either one.

ANSWER: TAYLOR OR HULSE

**BONUS**

14. ASTR; Short Answer: The observations by Taylor and Hulse confirmed whose theory of gravitational waves?

ANSWER: EINSTEIN'S

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### TOSS-UP

15. PHYS; Short Answer: A mass is undergoing simple harmonic motion. At which point in its trajectory does it experience the maximum magnitude of acceleration?

ANSWER: AT THE POINT OF ZERO VELOCITY, OR WHERE ITS VELOCITY CHANGES DIRECTION, OR AT THE ENDPOINTS OF ITS TRAJECTORY

### BONUS

15. PHYS; Multiple Choice: Which one of the following is not a simple machine?

- a) paper clip
- b) knife
- c) pulley
- d) screw driver

ANSWER: A--PAPER CLIP

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### TOSS-UP

16. CHEM; Multiple Choice: The area of chemistry that deals with the quantities of substances that enter into and are produced by chemical reactions is called:

- a) electrochemistry
- b) fluorescence
- c) stoichiometry
- d) spectrometry

ANSWER: C--STOICHIOMETRY

### BONUS

16. CHEM; Short Answer: In addition to water, what gas is evolved when ammonium nitrate is heated?

ANSWER: NITROUS OXIDE (ACCEPT N<sub>2</sub>O OR LAUGHING GAS)

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**TOSS-UP**

17. ERSC; Multiple Choice: Acid mine drainage results from the oxidation and dissolution of pyrite and other sulfide minerals in mine tailings and working faces of mines. Which of the following chemical constituents is NOT likely to be found at elevated concentrations in water affected by acid mine drainage?
- a) iron
  - b) manganese
  - c) sulfate
  - d) chloride

ANSWER: D--CHLORIDE

**BONUS**

17. ERSC; Multiple Choice: A thick black soil is likely to have formed under:
- a) a tropical rain forest
  - b) a grassland
  - c) a temperate deciduous forest
  - d) a conifer forest

ANSWER: B--A GRASSLAND

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**TOSS-UP**

18. GENR; Multiple Choice: What is the generally accepted age of the universe?
- a) 3 hundred million years
  - b) 1 billion years
  - c) 3 billion years
  - d) 10 billion years

ANSWER: D--10 BILLION YEARS

**BONUS**

18. GENR; Short Answer: A quartz crystal clock or watch operates based on what effect?

ANSWER: THE PIEZOELECTRIC EFFECT

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**TOSS-UP**

19. PHYS; Multiple Choice: The mass of an object is 1.1 kg, and its volume is 3 cubic meters. Its density is approximately:
- a) 3.7 kg/cubic meter
  - b) 0.37 kg/cubic meter
  - c) 0.3 kg/cubic meter
  - d) 3 kg/cubic meter

ANSWER: B--0.37 KG/CUBIC METER

**BONUS**

19. PHYS; Short Answer: Name the class of lever represented by the human arm.

ANSWER: THIRD CLASS

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**TOSS-UP**

20. BIOL; Short Answer: What is the longest-living land mammal after man?

ANSWER: THE ELEPHANT

**BONUS**

20. BIOL; Short Answer: What is a truffle?

ANSWER: AN (EDIBLE) FUNGUS

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**TOSS-UP**

21. CHEM; Multiple Choice: Which of the following compounds is a nonelectrolyte?

- a) sodium fluoride
- b) nitric acid
- c) sodium hydroxide
- d) glucose

ANSWER: D--GLUCOSE

**BONUS**

21. CHEM; Multiple Choice: Calces (kal-sez) on heating with charcoal become:

- a) phlogiston
- b) oxides
- c) metal
- d) salt

ANSWER: C--METAL

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**TOSS-UP**

22. PHYS; Short Answer: Ancient philosophers believed that heavy objects fell to the ground faster than light ones. Name the scientist whose experiments first proved that this belief was wrong.

ANSWER: GALILEO

**BONUS**

22. PHYS; Short Answer: The length of a 10 meter metal bar increases by 1 millimeter as the bar is heated from 300 K to 400 K. What would be the increase in length for a 5 meter bar of the same material for the same change in temperature?

ANSWER: 0.5 MILLIMETER

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**TOSS-UP**

23. MATH; Short Answer: What multiplicative property is demonstrated by the statement "a times b equals b times a"?

ANSWER: COMMUTATIVE (ACCEPT COMMUTATIVE OR COMMUTATIVITY)

**BONUS**

23. MATH; Short Answer: In early 1993, a centuries-old mathematical problem was supposedly solved that states that it is impossible to satisfy the equation: "X to the nth power plus Y to the nth power equals Z to the nth power" for positive integral values of X, Y, and Z when n is greater than 2. What is the name given to this problem?

ANSWER: FERMAT'S LAST THEOREM

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**TOSS-UP**

24. BIOL; Multiple Choice: What diarrheal disease has become an epidemic, infecting hundreds of thousands of people in South America in the past year, killing thousands of people:
- a) amoebiasis
  - b) travellers diarrhea
  - c) cholera
  - d) giardiasis

ANSWER: C -- CHOLERA

**BONUS**

24. BIOL; Short Answer: Cholera is one of the fastest killers among infectious diseases and this is due to the loss of two to five gallons of water a day by diarrhea. Death is due to dehydration and what?

ANSWER: LOW BLOOD PRESSURE OR SHOCK OR ACIDOSIS OR CIRCULATORY AND KIDNEY FAILURE

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**TOSS-UP**

25. CHEM; Short Answer: When you "slake" lime, what do you add to it?

ANSWER: WATER

**BONUS**

25. CHEM; Short Answer: Name the two elements with atomic numbers less than 92 which are not found in the earth's crust.

ANSWER: TECHNETIUM AND PROMETHIUM

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